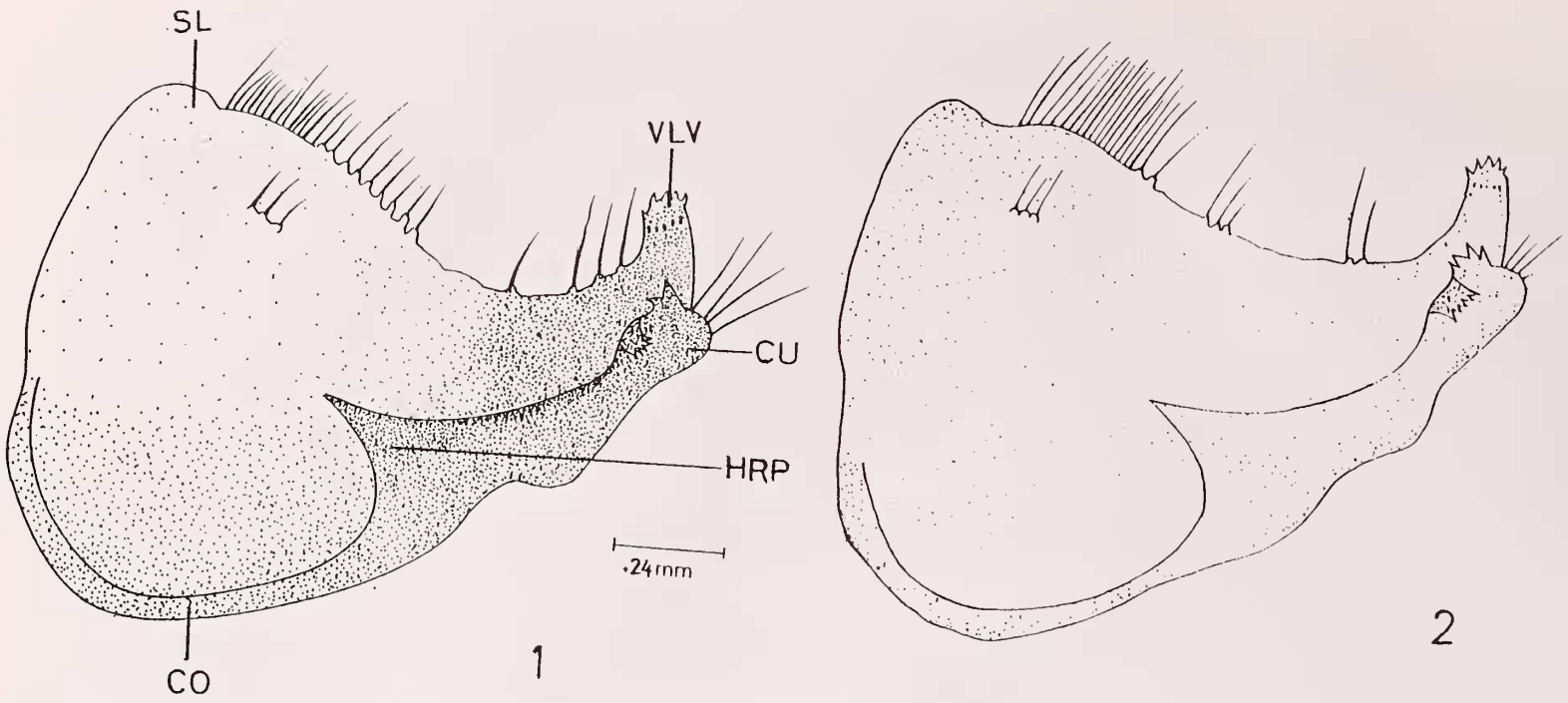

Figs. 1, 2: Valvae of *Junonia orithya*. (Fig. 1, Bajoura specimen.)

Abbreviations: CO, Costa; CU, Cucullus; HRP, Harpe; SL, Sacculus; VLV, Valvulla.

Mahog, 14.VI.92; 1 male, Karaian, 15.VI.91; 1 male, Paonta Sahib, 1.XI.91, 1 female, 16.V.93; 4 males Bajoura, 28. vii. 92. Uttar Pradesh: 1 female, Ranikhet, 28.IV.92; 1 female, Aglar valley, 4. VI.92; 1 female, Vikas nagar, 19.VI.92; 1 male, Mussoorie, 3.VI.92. Punjab: 6 males, 1 female, Patiala, 20.III.92; 1 female, 8.IV.92; 2 females, 18.IX.91; 1 female, 3.X.91; 1 female, 11.XI.91; 1 female, 10.IV.91; 6 males, 1 female, 4.V.93; 1 male, Sirhind, 29.III.91; 3 males, 4 females, Ludhiana, 11.IV.91; 1 male, 8.IV.91; 1 male, Govindgarh, 13.IV.91; 1 male, 1 female, Anandpur Sahib, 27.IV.91; 1 female Dhuri, 10.IV.91; 1 male, 1 female, Talwara, 30.V.91; 1 female, Nabha, 20.IX.91; 1 female, Ropar, 28.XI.91.

Acknowledgement

We are grateful to the Indian Council of Agricultural Research, New Delhi for providing financial assistance during the course of investigation.

March 7, 1995

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30. EFFECT OF TEMPERATURE ON HATCHING AND LARVAL DURATION IN *SEPSIS NITENS* (SEPSIDAE: DIPTERA)

Introduction

The bionomics of Sepsidae has not received the attention it deserves from medical entomologists, although they are important from veterinary and medical entomological view point. In India very little has been done on the bionomics and larval development of Sepsidae.

Temperature and humidity are known to affect the behaviour of many insects in nature and under laboratory conditions (Dakshinamurty 1948). I studied the population structure of Sepsidae of Aligarh District and also tested

their colour preference and effect of pesticides on these flies (Modassir 1993). In the present communication an attempt has been made to study the hatching, larval and pupal stages of *Sepsis nitens,* reared under laboratory conditions. The effect of temperature on the development of flies was also studied.

Materials and Methods

A laboratory colony of *Sepsis nitens* was developed by collecting adults from the field and keeping them in glass cages of 30 cm x 30 cm size. The females readily oviposited in the dung masses, kept in petri dishes in each cage and the larvae satisfactorily developed on buffalo dung. The same medium was used for hatching and development of larvae under laboratory conditions in the present study.

Results

The eggs of *Sepsis nitens* are laid intermittently in batches of 2 to 30. They are generally laid around the periphery of the dung mass and bear flagella-like appendage which projects from the surface of the dung. The eggs are oval in shape measuring 0.415 mm in length and 0.128 mm in width. The colour is creamy white. the flagella is nearly three to four times as long as the main body of the egg and may have respiratory function.

Temperature limits of eggs of *Sepsis nitens*: Observations were made to find the ovipositional behaviour and the hatching of eggs at temperature 10°, 15°, 20°, 26°, 32°, and 40°C (Table 1). Eggs did not hatch at 10°C in any of the experimental chambers. However, at 15°C the eggs hatched out in 12.5 hours and at 20°C in 12.3 hours. The incubation period was found to be 12 hours at a temperature ranging between 26° and 32 °C, and decreased further to 10 hours at 40°C. The moisture content of the dung, however, got reduced at 40°C, resulting in larval mortality just after hatching.

Larval development: Development of larvae was observed by keeping them under controlled temperature. The first instar larva was creamy white in colour, measuring 2.2 to 2.57 mm in size. The body is apparently twelve segmented and the cephalic and anal segments were clear. The cephalic segment was short and conical and armed with a pair of strong mouth hooks. The two posterior spiracles had a prominent anal protuberance. The first instar lasts for 2.4 to 2.8 days at a temperature of 28° to 30°C and 65 ± 5% relative humidity.

The creamish colour of second instar larva changes to brown in about six to eight hours. It measures 3.37 to 3.70 mm in size. The dorsal sensory papillae become prominent. The tubercular anterior spiracle becomes prominent.The duration of the second instar varies from 1.8 to 2.0 days at a temperature of 28° to 30°C and relative humidity of 65 ± 5%.

Table 1

THE DEVELOPMENT OF PRE-ADULT STAGES OF *Sepsis nitens* AT DIFFERENT TEMPERATURE

Temperature (°C)	Duration in days			Total duration in days
	Incubation period	Larval period	Pupal period	
10.0	—	—	—	—
15.0	0.52	10.6	7.2	18.32
20.0	0.51	8.5	6.2	15.21
26.0	0.50	7.5	4.0	12.00
32.0	0.50	8.3	3.5	12.30
40.0	0.42	7.2	2.4	10.02

The second instar larv moults to third instar after about 4 days. the third instar larva measures 5.3 mm in size. Morphological features of the larva became prominent at this stage. Dorsal and ventral sensory plates are present with papillae at the terminal. The third instar larva shows characteristic jumping movements by fixing its mouth hooks into the posterior notches.

Effect of temperature on larval development: The effect of temperature was observed on the larvae of *S. nitens* by keeping them in petri dishes with dung at 10°, 15°, 20°, 26°, 32° and 40°C constant temperature. The larvae were obtained from the laboratory colony. No change in larval development could be observed at 10°C. At 15°C total larval duration lasted for 10.6 days while at 20°, 26° and 32°C the larval duration was reduced to 8.5, 7.5 and 8.3 days, respectively. At 40°C the dung dried up within a few hours and no development in the larvae could be noticed. On the contrary, there was mortality of larvae at 40°C due to the dryness of the dung mass.

Pupa: The pupae were somewhat elongated, nearly 4.0 mm in length and 1.0 mm in width. Both ends were pointed and a ventral pair of tubercles was present at the base of the posterior spiracular stalks. The pupae were at first light brown in colour but changed to dark brown in about 24 hours. The pupal period was found to be 3.5 to 4 days at a temperature of 26° to 32°C and 65 ± 5% relative humidity.

The relation between temperature and pre-adult stages of *S. nitens* was derived by the simple regression equation $Y = a + bX$ where Y is duration of development in days, X is temperature and *a* and *b* are constant to be determined by least square.

In this way a linear relationship was obtained with regression equation Y = 28.05 + 0.55X. This linear relationship would become distinctly curvilinear if the extremes of temperature are also considered (Andrewartha and Birch 1954).

The effect of temperature on developmental stages is given in Table 1. As the temperature increased the total duration of pre-adult stage decreased, thus showing an inverse relation. The ideal range of temperature was between 15° and 26°C for larval and pupal development.

Discussion

The development and activity in many insects increase in proportion with the suitability of climatic conditions particularly in the tropics (Dakshinamurty 1948). Under laboratory conditions the success of the experiment depends on the culture medium and development of the larvae. *Sepsis nitens* lays its eggs in dung masses which hatch out within days in the laboratory. The eggs are similar to those of *S. lateralis,* described by Hafez (1947). The larval features of *S. nitens* are similar to those of European and American Sepsidae (Henning 1952, Wharton and Roeger 1977).

The present series of observations suggested that the incubation period could be greatly dependent on temperature conditions and is prolonged at lower temperatures. Therefore the environmental conditions may be important for the breeding and growth of sepsids in nature.

The humidity is also important in larval development. For sepsids the moist dung mass kept at temperatures of 20° to 28°C was ideal for development. The combined effect of temperature and humidity can be profound on the larval development. Hammer (1942) could not find larvae of sepsid flies during the winter months. The viability of eggs and the development of larvae is inversely related to temperature. Normal development would be obtained within the limits of favourable range of temperatures and humidity. The pupal period reduced with increasing temperature but at higher temperature there is a risk of death of larvae and pupae due to drying of the medium.

Acknowledgement

I express my sincere gratitude to Professor Nawab Hasan, former Head, Department of Zoology, under whose guidance this study was carried out.

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31. RECORD OF THREE SPECIES OF *RHOMBOGNATHUS* (HALACARIDAE: ACARI) FROM INDIAN OCEAN REGION

(*With twentyfive text-figures*)

Species of the Subfamily Rhombognathinae are phytophagous in nature. All occur in photic zone of marine or brackish water and mainly occur in association with algae, though a few forms have also been reported from interstitial sands.

Rhombognathus apsteini Lohmann is known from Kerguelen Island of temperate Indian Ocean (Lohmann 1907 a, b; Bovee *et al.* 1973, Newell 1984). Rao and Ganapati 1968 reported *Rhombognathus* sp. from interstitial sands of Waltair coast.

Rhombognathus papuensis Bartsch, 1989

Many specimens were collected among different algae from Visakhapatnam coast, Cape Comorin coast, Kovalam